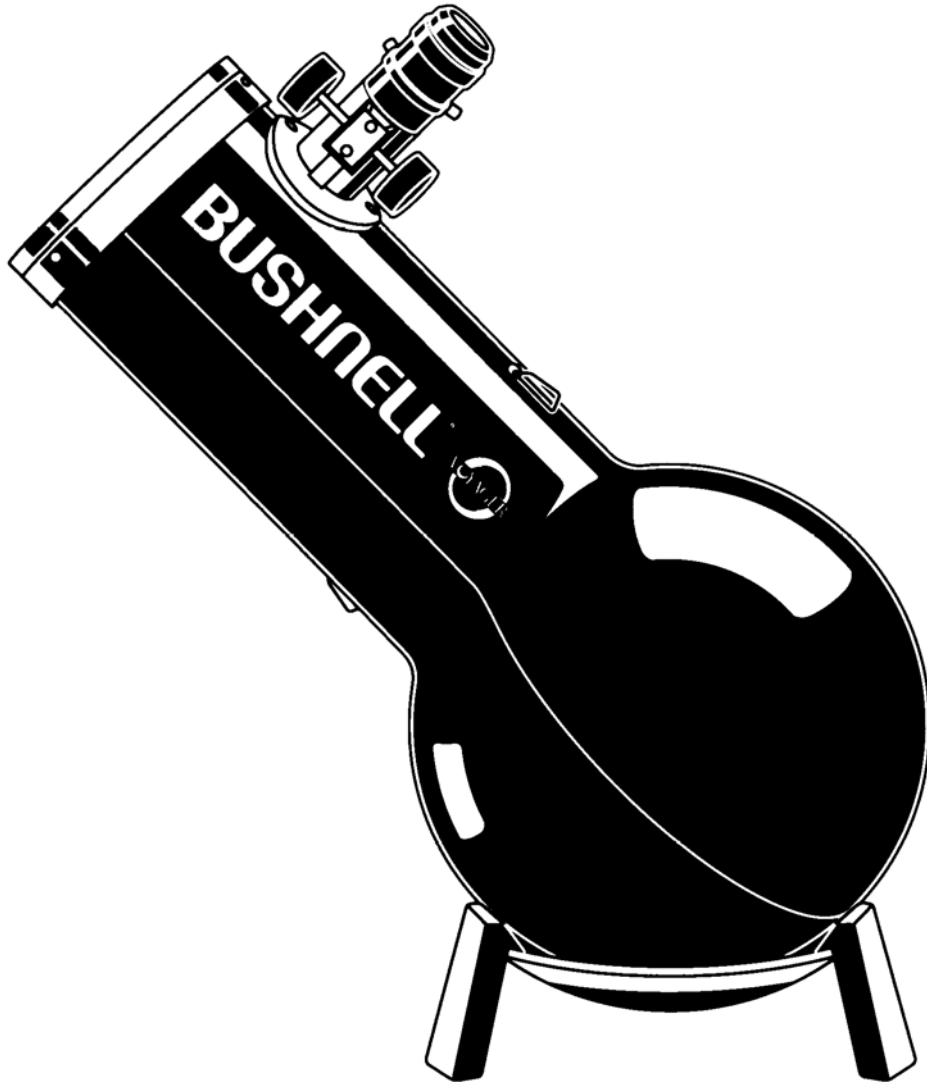




**VOYAGER® 4.5 INCH FAMILY TELESCOPE  
MODEL 78-2010**



*Never Look Directly At The Sun With Your Telescope  
Permanent Damage To Your Eyes May Occur*

Thank you for purchasing the Bushnell Voyager Family Telescope! Your new telescope has been designed and crafted with the highest standards so that you may have years of enjoyment and use out of this wonderful window to the heavens. This product comes complete with everything you'll need to explore your universe. Whether you are just starting out in astronomy or you are an avid astronomer we wish you, your family, and your friends all the best with this telescope.

Please utilize this manual to its fullest potential by reading it completely before you attempt to use your new telescope. Once set-up, we've included a basic guide on how to get started in astronomy at the end of this manual. While this is not a complete guide, it will give you some initial pointers. As you advance in ability, we would highly recommend a supplemental star atlas, beginning astronomy guide, moon map, or any other guide as you travel on your journey through the universe.

## **READ THROUGH THESE INSTRUCTIONS BEFORE YOU USE YOUR TELESCOPE**

### **UNPACKING YOUR TELESCOPE**

Included in your package you will find the main telescope body, the cradle base, a convenient shoulder strap, and two eyepieces. Make sure that you've identified all the components before trying to use your new telescope.

**YOUR BUSHNELL® VOYAGER® FAMILY TELESCOPE COMES PREASSEMBLED FROM OUR FACTORY. THE ONLY STEPS THAT YOU MUST TAKE TO USE YOUR TELESCOPE FOLLOW.**

### **PLACE TELESCOPE IN CRADLE BASE**

1. Remove the Voyager Reflector Telescope Body (2) from carton.
2. Remove the Cradle Base (3) from the carton.
3. Place Telescope Body (2) into Cradle Base (3) making sure that the sphere-shaped end of the telescope fits into the Cradle Base (3).

### **THE FINAL STEPS**

1. Remove 1.25" Format Eyepiece (1) from carton.
2. Insert into Rack & Pinion Focusing Mechanism (4).
3. Remove Protective Dust Cover from end of telescope nearest the Rack & Pinion Focusing Mechanism (4).
4. Let the adventure begin.

*Your Bushnell Telescope is now ready to be used. To obtain the fullest enjoyment from your telescope, please refer to the following additional information.*

*Astronomical Telescopes are designed in such a way that the image you see will appear UPSIDE DOWN and REVERSED, this is acceptable for viewing celestial bodies.*

## **SHOULDER STRAP ATTACHMENT (IF DESIRED)**

1. Remove the Adjustable Shoulder Strap (8) (not shown) from the carton.
2. Attach one end of the Adjustable Shoulder Strap (8) to the Forward Clips (6) on the side of the Telescope Body (2).
3. Attach the other end of the Adjustable Shoulder Strap (8) to either the other Forward Clip (6) or the Rear Clip (7), whichever provides the most comfortable position. Adjust the Shoulder Strap (8) and enjoy.

## **TELESCOPE USE**

### **SELECTING AN EYEPIECE:**

1. You should always start viewing with the lowest power eyepiece, which in this case is the 31 mm lens. Note: the base power of each eyepiece is determined by the focal length of the telescope objective element, which for this model is 500 mm. A formula can be used to determine the power of each eyepiece: **telescope OBJECTIVE mirror focal length ÷ EYEPIECE focal length = MAGNIFICATION** (e.g. Using the 31 mm lens, the calculation would look like this: 500 mm ÷ 31mm = 16x or 16 power.) In addition, the 5mm eyepiece will provide a magnification of 100x or 100 power.
2. Offered as an accessory for this telescope is a Barlow lens (model #78-0105). Barlow lenses are used to double or triple the power of your telescope by placing your Barlow between the focusing tube and the eyepiece. Using the example above, a 2x Barlow lens would give you a total power of 32x or 32 power. (16 x 2 = 32x or 32 power). The 2x Barlow Lens (model #78-0105) would provide a 200x or 200 power magnification when used in conjunction with the 5mm eyepiece. Other accessories available include a 9mm eyepiece (model #78-0101) that would give you 56x or 56 power and a standard camera adapter (model #78-0104) for photographing the night sky.

### **FOCUSING TELESCOPE:**

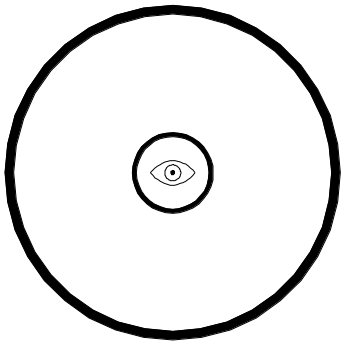
1. After inserting the eyepiece, aim the main telescope tube at a land-based target at least 200 yards away (e.g. A telephone pole or building). Fully extend focusing tube by turning Rack & Pinion Focusing Mechanism (4)
2. While looking through selected eyepiece (in this case the 31 mm), slowly retract focusing tube by turning Rack & Pinion Focusing Mechanism (4) until object comes into focus.

### **COLLIMATING THE SECONDARY MIRROR**

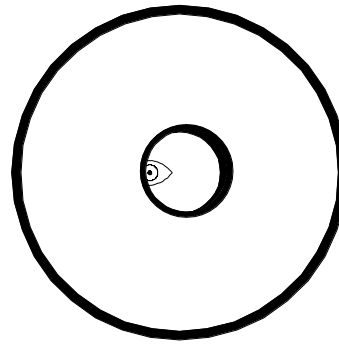
Good alignment or collimation of the telescope's optical components will guarantee the most optimum viewing. **This telescope body comes preassembled from the factory and precollimated. Therefore collimation should not be required.** However, due to its great importance there are a few steps that you can take to ensure that your telescope is properly collimated.

1. Remove the 1.25" Format Eyepiece (1) from the Rack and Pinion Focusing Mechanism (4).
2. Look into the Rack and Pinion Focusing Mechanism (4) with the eyepiece removed. You will see the Secondary Mirror (5) located a few inches inside the end of the telescope tube nearest the Rack and Pinion Focusing Mechanism (4). Since it is a mirror, you will see a reflection of the large primary mirror. That mirror will show an image of the Secondary Mirror (5) and your eye. Each image will be centered in a concentric set of images starting with the image of the primary mirror, the Secondary Mirror (5), and your eye.
3. Please refer to the diagram to see what to expect.

## Secondary Mirror Collimated



## Secondary Mirror (Out of Alignment)



4. If the image of your eye is centered in the reflection of the Secondary Mirror (5), your Secondary Mirror (5) is collimated. If it is off to one side, then secondary mirror adjustment will be required. You will see three screw heads on the Secondary Mirror (5). They are positioned 120 degrees apart. By adjusting these three screws very slowly and carefully, the Secondary Mirror (5) will reflect an image of your eye that is perfectly centered in the reflection of the Secondary Mirror (5). Once this is accomplished, your Secondary Mirror (5) is now collimated.
5. Your telescope is now ready to deliver the best images possible.

### Enjoying Your New Telescope

1. First determine your targeted object. Any bright object in the night sky is a good starting point. One of the favorite starting points in astronomy is the moon. This is an object sure to please any budding astronomer or experienced veteran. When you have developed proficiency at this level, other objects become good targets. Saturn, Mars, Jupiter, and Venus are good second steps to take.
2. Avoid the temptation to move directly to the highest power. The low power eyepiece will give you a wider field of view, and brighter image--thus making it very easy to find your target object. At this point with a focused image, you've passed the first obstacle. Once you pass this step, you'll will enjoy the time spent with your telescope. Every celestial object you center in the telescope will be easily focused, which is important for continuing your exploration of the night sky.
3. The low power eyepieces are perfect for viewing the full moon, planets, star clusters, nebulae, and even constellations. These should build your foundation. However, for more detail, try bumping up in magnification to higher power eyepieces on some of these objects. During calm and crisp nights, the light/dark separation line on the moon (called the "Terminator") is marvelous at high power. You can see mountains, ridges and craters jump out at you due to the highlights. Similarly, you can move up to higher magnifications on the planets and nebulae. Star clusters and stars are best viewed through the low power no matter what.
4. The recurring astronomical theater we call the night sky is an ever-changing billboard. In other words, not the same movie plays all the time. Rather, the positions of the stars change not only hourly as they seem to rise and set, but also throughout the year. As the earth orbits the sun our perspective on the stars changes on a yearly cycle about that orbit. The reason the sky seems to move daily just as the sun and the moon "move" across our sky, is that the earth is rotating about its axis. As a result you may notice that after a few minutes or a few seconds depending on what power you are viewing at, the objects in your telescope will move. At higher magnifications especially, you will notice that the moon or Jupiter will "race" right out of the field of view. To compensate, just move your telescope to "track" it in the necessary path.

## Helpful Hints

1. Your telescope is a very sensitive instrument. For best results and fewer vibrations set your telescope up on a level location on the ground rather than your concrete driveway or your wooden deck. This will provide a more stable foundation for viewing, especially if you've drawn a crowd with your new telescope.
2. If possible view from a location that has relatively few lights. This will allow you to see much fainter objects. You'd be surprised how much more you'll see from your local lake or park when compared to a backyard in the city.
3. Using your telescope out a window is NEVER recommended.
4. View objects that are high in the sky if possible. Waiting until the object rises well above the horizon will provide a brighter and crisper image. Objects on the horizon are viewed through several layers of earth's atmosphere. Ever wonder why the moon appears orange as it sets on the horizon. It's because you are looking through a considerable more amount of atmosphere than you would directly overhead. (Note: If objects high in the sky are distorted or wavy, you are probably viewing on a very humid night.) During nights of unstable atmosphere, viewing through a telescope can be frustrating if not impossible. Astronomers refer to crisp, clear nights as nights of "good seeing."

## Where do I start?

Your Bushnell telescope can bring the wonders of the universe to your eye. While this manual is intended to assist you in the set-up and basic use of this instrument, it does not cover everything you might like to know about astronomy. The first thing you need to do is get a very simple star chart and a flashlight with a red bulb or red cellophane over the end. For objects other than stars and constellations, a basic guide to astronomy is a must. Some recommended sources appear on our website at [www.bushnell.com](http://www.bushnell.com). Also on our website will be current events in the sky for suggested viewing. But, some of the standbys that you can see are:

The Moon--a wonderful view of our lunar neighbor can be enjoyed with any magnification. Try viewing at different phases of the moon. Lunar highlands, lunar maria (lowlands called "seas" for their dark coloration), craters, ridges and mountains will astound you.

Saturn--even at the lowest power you should be able to see Saturn's rings and moons. This is one of the most satisfying objects in the sky to see simply because it looks like it does in pictures. Imagine seeing what you've seen in textbooks or NASA images from your backyard!

Jupiter--the largest planet in our solar system is spectacular. Most noted features are its dark stripes or bands both above and below its equator. These are the north and south equatorial belts. Also interesting are Jupiter's four major moons. Pay close attention to their positions from night to night. They appear to be lined up on either side of Jupiter.

Mars--The Great Red Planet appears as a reddish-orange disk. Look at different times of the year and try to catch a glimpse of the white polar ice caps.

Venus--just like the moon, Venus changes phases from month to month. Some views of brilliant Venus appear as if you were looking at a distant crescent moon.

Nebulae--The Great Orion Nebula is a very well known night sky object. This and many others are brought to you by this telescope.

Star Clusters--View millions of stars densely packed in a cluster that resembles a ball.

Galaxies--One of the greatest and most interesting galaxies is our neighbor the Andromeda Galaxy. Enjoy this and many others.

For further questions or additional information please contact:

Bushnell Sports Optics Worldwide  
8500 Marshall Drive  
Lenexa, KS 66214

[www.bushnell.com](http://www.bushnell.com)

### **ANSWERS TO COMMONLY ASKED QUESTIONS**

1. The image I see in the telescope is upside down and reversed from right to left ?	<ul style="list-style-type: none"> <li>• An upside-down and reversed image is a common characteristic of most astronomical telescopes. Since telescopes are used for astronomical viewing orientation is not important.</li> </ul>
2. How do I determine the power my telescope ?	<ul style="list-style-type: none"> <li>• The power of your telescope can be determine by dividing the focal length of the objective lens by the focal length of the eyepiece. The eyepiece focal length is the number printed on the eyepiece. (For example: <math>500 \div 5 = 100X</math>)</li> </ul>
3. Where do I find the Telescope Focal Length	<ul style="list-style-type: none"> <li>• The telescope focal length is the same focal length as the objective focal length. For this telescope it is 500mm. Telescope focal lengths range from 500mm to 1200mm on Bausch &amp; Lomb and Bushnell telescopes.</li> </ul>
4. What can I see with my telescope ?	<ul style="list-style-type: none"> <li>• Telescopes with power ranging from 16X to 50X can be used to view Star Clusters and Nebulae. 90X to 120X telescope can view galaxies. Most planets can be seen at any magnification.</li> </ul>
5. What do the numbers on the eyepiece mean ?	<ul style="list-style-type: none"> <li>• The numbers on the eyepiece represents the "Focal Length" of the eyepiece.</li> </ul>

### **TROUBLESHOOTING GUIDE**

<p><i>If after you have set-up your new telescope you are unable to see any objects, use this Quick Reference guide to help you to understand the cause of the problem and quickly determine a remedy</i></p>	
1. I've completed the set-up yet I cannot see anything	<ul style="list-style-type: none"> <li>• Check to see if objective lens cover has been removed.</li> <li>• Try to view an object that is 200 or more yards away.</li> </ul>

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| <ul style="list-style-type: none"><li>• If there is more than one eyepiece included with the telescope, use the lowest power (highest number) eyepiece to begin viewing.</li></ul> |
| <ul style="list-style-type: none"><li>• Use the Rack &amp; Pinion Focusing Mechanism to bring the object you are trying to view into focus</li></ul>                               |

## **Telescope LIFETIME LIMITED WARRANTY**

Your telescope is warranted to be free of defects in materials and workmanship for the lifetime of the original owner. The Lifetime Limited Warranty is an expression of our confidence in the materials and mechanical workmanship of our products and is your assurance of a lifetime of dependable service.

If your telescope contains electrical components the electronic components are warranted to be free of defects in materials and workmanship for one year after the date of purchase.

In the event of a defect under this warranty, we will, at our option, repair or replace the product, provided that you return the product postage prepaid. This warranty does not cover damages caused by misuse or improper handling, installation or maintenance of the product.

Any return made under this warranty must be accompanied by the items listed below:

- 1) A check in the amount of \$15.00 to cover the cost of handling
- 2) Name and address for product return
- 3) An explanation of the defect
- 4) Product should be well packed in a sturdy outside shipping carton to prevent damage in transit and return postage prepaid to the address listed below:

IN U.S.A. Send To:

Bushnell \* 8500 Marshall Drive \* Lenexa, Kansas 66214

IN CANADA Send To:

Bushnell \* 25A East Pearce Street, Unit 1 \* Richmond Hill, Ontario L4B 2M9

For products purchased outside the United States and Canada please contact your local dealer for applicable warranty information. This warranty gives you specific legal rights. You may have other rights which vary from country to country.

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